

Computer Systems Analysts

(O*NET 15-1051.00)

Significant Points

- Employers generally prefer applicants who have at least a bachelor's degree in computer science, information science, or management information systems (MIS).
- Employment is expected to increase much faster than the average as organizations continue to adopt increasingly sophisticated technologies.
- Job prospects are favorable.

Nature of the Work

All organizations rely on computer and information technology to conduct business and operate more efficiently. The rapid spread of technology across all industries has generated a need for highly trained workers to help organizations incorporate new technologies. The tasks performed by workers known as computer systems analysts evolve rapidly, reflecting new areas of specialization or changes in technology, as well as the preferences and practices of employers.

Computer systems analysts solve computer problems and apply computer technology to meet the individual needs of an organization. They help an organization to realize the maximum benefit from its investment in equipment, personnel, and business processes. Systems analysts may plan and develop new computer systems or devise ways to apply existing systems' resources to additional operations. They may design new systems, including both hardware and software, or add a new software application to harness more of the computer's power. Most systems analysts work with specific types of systems—for example, business, accounting, or financial systems, or scientific and engineering systems—that vary with the kind of organization. Some systems analysts also are known as *systems developers* or *systems architects*.

Systems analysts begin an assignment by discussing the systems problem with managers and users to determine its exact nature. Defining the goals of the system and dividing the solutions into individual steps and separate procedures, systems analysts use techniques such as structured analysis, data modeling, information engineering, mathematical model building, sampling, and cost accounting to plan the system. They specify the inputs to be accessed by the system, design the processing steps, and format the output to meet users' needs. They also may prepare cost-benefit and return-on-investment analyses to help management decide whether implementing the proposed technology will be financially feasible.

When a system is accepted, systems analysts determine what computer hardware and software will be needed to set the system up. They coordinate tests and observe the initial use of the system to ensure that it performs as planned. They prepare specifications, flow charts, and process diagrams for computer programmers to follow; then, they work with programmers to "debug," or eliminate, errors from the system. Systems analysts who do more in-depth testing of products may be referred to as *software quality assurance analysts*. In addition to running tests, these individuals diagnose problems, recommend solutions, and determine whether program requirements have been met.

In some organizations, *programmer-analysts* design and update the software that runs a computer. Because they are responsible for both programming and systems analysis, these workers must be proficient in both areas. (A separate statement on computer programmers appears elsewhere in the *Handbook*.) As this dual profi-



Computer systems analysts help organizations get the most out of available technology.

ciency becomes more commonplace, these analysts are increasingly working with databases, object-oriented programming languages, as well as client-server applications development and multimedia and Internet technology.

One obstacle associated with expanding computer use is the need for different computer systems to communicate with each other. Because of the importance of maintaining up-to-date information—accounting records, sales figures, or budget projections, for example—systems analysts work on making the computer systems within an organization, or among organizations, compatible so that information can be shared among them. Many systems analysts are involved with "networking," connecting all the computers internally—in an individual office, department, or establishment—or externally, because many organizations rely on e-mail or the Internet. A primary goal of networking is to allow users to retrieve data from a mainframe computer or a server and use it on their desktop computer. Systems analysts must design the hardware and software to allow the free exchange of data, custom applications, and the computer power to process it all. For example, analysts are called upon to ensure the compatibility of computing systems between and among businesses to facilitate electronic commerce.

Working Conditions

Computer systems analysts work in offices or laboratories in comfortable surroundings. They usually work about 40 hours a week—the same as many other professional or office workers

do. However, evening or weekend work may be necessary to meet deadlines or solve specific problems. Given the technology available today, telecommuting is common for computer professionals. As networks expand, more work can be done from remote locations through modems, laptops, electronic mail, and the Internet.

Like other workers who spend long periods in front of a computer terminal typing on a keyboard, computer systems analysts are susceptible to eyestrain, back discomfort, and hand and wrist problems such as carpal tunnel syndrome or cumulative trauma disorder.

Training, Other Qualifications, and Advancement

Rapidly changing technology requires an increasing level of skill and education on the part of employees. Companies increasingly look for professionals with a broad background and range of skills, including not only technical knowledge, but also communication and other interpersonal skills. This shift from requiring workers to possess solely sound technical knowledge emphasizes workers who can handle various responsibilities. While there is no universally accepted way to prepare for a job as a systems analyst, most employers place a premium on some formal college education. Relevant work experience also is very important. For more technically complex jobs, persons with graduate degrees are preferred.

Many employers seek applicants who have at least a bachelor's degree in computer science, information science, or management information systems (MIS). MIS programs usually are part of the business school or college and differ considerably from computer science programs, emphasizing business and management-oriented course work and business computing courses. Employers are increasingly seeking individuals with a master's degree in business administration (MBA), with a concentration in information systems, as more firms move their business to the Internet.

Despite employers' preference for those with technical degrees, persons with degrees in a variety of majors find employment as system analysts. The level of education and type of training that employers require depend on their needs. One factor affecting these needs is changes in technology. Employers often scramble to find workers capable of implementing "hot" new technologies such as the wireless Internet. Those workers with formal education or experience in information security, for example, are in demand because of the growing need for their skills and services. Another factor driving employers' needs is the timeframe during which a project must be completed.

Employers usually look for people who have broad knowledge and experience related to computer systems and technologies, strong problem-solving and analytical skills, and good interpersonal skills. Courses in computer science or systems design offer good preparation for a job in these computer occupations. For jobs in a business environment, employers usually want systems analysts to have business management or closely related skills, while a background in the physical sciences, applied mathematics, or engineering is preferred for work in scientifically oriented organizations.

Job seekers can enhance their employment opportunities by participating in internship or co-op programs offered through their schools. Because many people develop advanced computer skills in a non-computer-related occupation and then transfer those skills to a computer occupation, a background in the industry in which the person's job is located, such as financial services, banking, or accounting, can be important. Others have taken computer science courses to supplement their study in fields such as accounting, inventory control, or other business areas.

Computer systems analysts must be able to think logically and have good communication skills. Because they often deal with a number of tasks simultaneously, the ability to concentrate and pay close attention to detail is important. Although these workers sometimes work

independently, they frequently work in teams on large projects. They must be able to communicate effectively with computer personnel, such as programmers and managers, as well as with users or other staff who may have no technical computer background.

Systems analysts may be promoted to senior or lead systems analyst. Those who show leadership ability also can become project managers or advance into management positions such as manager of information systems or chief information officer. Workers with work experience and considerable expertise in a particular subject or a certain application may find lucrative opportunities as independent consultants or may choose to start their own computer consulting firms.

Technological advances come so rapidly in the computer field that continuous study is necessary to keep one's skills up to date. Employers, hardware and software vendors, colleges and universities, and private training institutions offer continuing education. Additional training may come from professional development seminars offered by professional computing societies.

Employment

Computer systems analysts held about 487,000 jobs in 2004; about 28,000 were self-employed.

Although they are increasingly employed in every sector of the economy, the greatest concentration of these workers is in the computer systems design and related services industry. Firms in this industry provide services related to the commercial use of computers on a contract basis, including custom computer programming services; computer systems integration design services; computer facilities management services, including computer systems or data processing facilities support services for clients; and other computer services, such as disaster recovery services and software installation. Computer systems analysts are also employed by governments, insurance companies, financial institutions, Internet service providers, data processing services firms, and universities.

A growing number of systems analysts are employed on a temporary or contract basis; many of these individuals are self-employed, working independently as contractors or consultants. For example, a company installing a new computer system may need the services of several systems analysts just to get the system running. Because not all of the analysts would be needed once the system is functioning, the company might contract for such employees with a temporary help agency or a consulting firm or with the systems analysts themselves. Such jobs may last from several months up to 2 years or more. This growing practice enables companies to bring in people with the exact skills the firm needs to complete a particular project, rather than having to spend time or money training or retraining existing workers. Often, experienced consultants then train a company's in-house staff as a project develops.

Job Outlook

Employment of computer systems analysts is expected to grow much faster than the average for all occupations through the year 2014 as organizations continue to adopt and integrate increasingly sophisticated technologies. Job increases will be driven by very rapid growth in computer system design and related services, which is projected to be among the fastest growing industries in the U.S. economy. In addition, many job openings will arise annually from the need to replace workers who move into managerial positions or other occupations or who leave the labor force. Job growth will not be as rapid as during the previous decade, however, as the information technology sector begins to mature and as routine work is increasingly outsourced to lower-wage foreign countries.

Workers in the occupation should enjoy favorable job prospects. The demand for networking to facilitate the sharing of

information, the expansion of client–server environments, and the need for computer specialists to use their knowledge and skills in a problem-solving capacity will be major factors in the rising demand for computer systems analysts. Moreover, falling prices of computer hardware and software should continue to induce more businesses to expand their computerized operations and integrate new technologies into them. In order to maintain a competitive edge and operate more efficiently, firms will keep demanding system analysts who are knowledgeable about the latest technologies and are able to apply them to meet the needs of businesses.

Increasingly, more sophisticated and complex technology is being implemented across all organizations, which should fuel the demand for these computer occupations. There is a growing demand for system analysts to help firms maximize their efficiency with available technology. Expansion of electronic commerce—doing business on the Internet—and the continuing need to build and maintain databases that store critical information on customers, inventory, and projects are fueling demand for database administrators familiar with the latest technology. Also, the increasing importance being placed on “cybersecurity”—the protection of electronic information—will result in a need for workers skilled in information security.

The development of new technologies usually leads to demand for various kinds of workers. The expanding integration of Internet technologies into businesses, for example, has resulted in a growing need for specialists who can develop and support Internet and intranet applications. The growth of electronic commerce means that more establishments use the Internet to conduct their business online. The introduction of the wireless Internet, known as WiFi, creates new systems to be analyzed. The spread of such new technologies translates into a need for information technology professionals who can help organizations use technology to communicate with employees, clients, and consumers. Explosive growth in these areas also is expected to fuel demand for analysts who are knowledgeable about network, data, and communications security.

As technology becomes more sophisticated and complex, employers demand a higher level of skill and expertise from their employees. Individuals with an advanced degree in computer science or computer engineering, or with an MBA with a concentration in information systems, should enjoy favorable employment prospects. College graduates with a bachelor’s degree in computer science, computer engineering, information science, or MIS also should enjoy favorable prospects for employment, particularly if they have supplemented their formal education with practical experience. Because employers continue to seek computer specialists who can combine strong technical skills with good interpersonal and business skills, graduates with non-computer-science degrees, but who have had courses in computer programming, systems analysis, and other information technology subjects, also should continue to find jobs in computer fields. In fact, individuals with the right experience and training can work in computer occupations regardless of their college major or level of formal education.

Earnings

Median annual earnings of computer systems analysts were \$66,460 in May 2004. The middle 50 percent earned between \$52,400 and \$82,980 a year. The lowest 10 percent earned less than \$41,730, and the highest 10 percent earned more than \$99,180. Median annual earnings in the industries employing the largest numbers of computer systems analysts in May 2004 were:

Federal Government.....	\$71,770
Computer systems design and related services.....	69,560
Management of companies and enterprises	67,230
Insurance carriers	66,840
State government	57,040

According to the National Association of Colleges and Employers, starting offers for graduates with a master’s degree in computer science averaged \$62,727 in 2005. Starting offers averaged \$50,820 for graduates with a bachelor’s degree in computer science; \$46,189 for those with a degree in computer systems analysis; \$44,417 for those with a degree in management information systems; and \$44,775 for those with a degree in information sciences and systems.

According to Robert Half International, starting salaries for systems analysts ranged from \$61,500 to \$82,500 in 2005.

Related Occupations

Other workers who use computers extensively, and who use logic and creativity to solve business and technical problems, include computer programmers, computer software engineers, computer and information systems managers, engineers, mathematicians, statisticians, operations research analysts, management analysts, and actuaries.

Sources of Additional Information

Further information about computer careers is available from:

- Association for Computing Machinery (ACM), 1515 Broadway, New York, NY 10036. Internet: <http://www.acm.org>
- Institute of Electrical and Electronics Engineers Computer Society, Headquarters Office, 1730 Massachusetts Ave. NW., Washington, DC 20036-1992. Internet: <http://www.computer.org>
- National Workforce Center for Emerging Technologies, 3000 Landerholm Circle SE., Bellevue, WA 98007. Internet: <http://www.nwcet.org>